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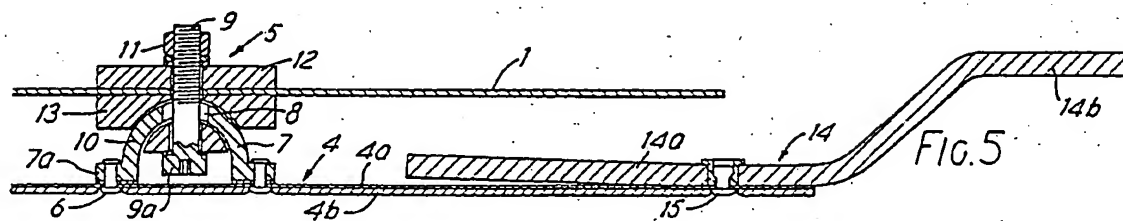
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(54) Magnetic mounting means.

(57) A magnetic mounting, for securing a structure (4) by magnetic attraction on a sub-structure (2) of a magnetic material, has a base element (4b) which is flexible to lie intimately in contact with the contour of the sub-structure (2) and which is permanently magnetic, a support (1) for carrying the structure or to be incorporated in the structure, and two spaced couplings (5) each connecting a respective area of the base element (4b) to the support (1), each such coupling permitting a universal movement, within limits, of the base element (4b) relative to the support (1).



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"Magnetic Mounting Means"

This invention relates to a means for mounting a structure by magnetic attraction on a sub-structure of a magnetic material.

Whilst in no way restricted to such use, the invention is of particular applicability in the securing of structures, such as signs, to the complexly curved steel roofs of motor vehicles.

The object of the invention is to provide such a mounting means which incorporates magnetic attraction applied over a relatively broad zone, whilst nevertheless being capable of adapting itself to a contour of the sub-structure within the confines of that zone, and in particular to two curvatures of the sub-structure in two directions, e.g. at a right angle.

According to the present invention a magnetic mounting means comprises:

(i) one or a pair of base elements each having such shape and dimensions as will permit it to overlie a zone of the sub-structure, the base element being flexible to enable it to adapt itself to the contour of the sub-structure and lie intimately in contact with a surface of the sub-structure at least at island sites thereof and preferably continuously over the entire zone, said base being permanently magnetic over at least said island sites and preferably over the entire zone;

(ii) a support, for carrying the structure or to be incorporated in the structure, the support being relatively non-flexible;

(iii) two spaced couplings each connecting a respective area of the or each base element to the support, each said coupling permitting a universal movement (within limits) of its respective connected area, of the base element, relative to the support.

In a preferred arrangement, the support is associated with at least two pairs of couplings, the couplings of each individual pair being spaced along a first direction, to accommodate for example a first curvature of the substructure, and the pairs of couplings being themselves spaced along a second direction, e.g. at a right angle, to accommodate for example a second curvature of the substructure. By way of example, in an arrangement for securing a sign on a vehicle roof, a support elongate in the transverse dimension of the vehicle roof may have two pairs of couplings each associated with a respective base element, the base elements being spaced transversely of the roof and the couplings of each base element being spaced fore-and-aft of the vehicle roof.

Advantageously, the base member is permanently magnetic for adherence over the whole of its exposed underside surface area, to contact the surface of the sub-structure, and for this purpose may comprise a layer of flexible material, such as rubber and/or synthetic resinous plastics, having permanent magnetic property.

In a convenient construction, the couplings comprise a cup element secured permanently, e.g. as by riveting, to an area of the base element and having inner and outer part-spherical surfaces with a common centre, and inner and outer holding elements respectively embracing said inner and outer part-spherical surfaces of the cup, means retaining said holding elements and said cup in assembly and permitting rotational movement thereof within limits about said centre, and means securing said outer holding element to said support. Advantageously, the couplings are provided on reinforced portions of the support, e.g. on longitudinal or transverse ribs thereof.

Preferably, the retaining means are tightenable for retaining the holding elements in a position to which they are set, whilst conforming to the curvature of the sub-structure. By way of example, such tightening means may be a bolt carrying a nut which can be tightened thereon to draw elements of the coupling into tight engagement. Said bolt and nut may likewise serve to secure said outer holding element to said support.

Where the base element is adapted to be magnetically attracted to the sub-structure over the whole of the surface of the base element, the couplings are preferably secured to the respective area of the base element by means which are recessed within the base element so as not to protrude against the surface of the sub-structure, e.g. rivets engaged in recesses in the exposed surface of the base element.

Means may be provided to facilitate separation of the magnetic base element from the sub-structure against the magnetic force. In a preferred form, such separation means comprise a lifter, which may be manually operable, secured to a point of the base element adjacent to an edge thereof and extending inboard of said point of securing for abutment against the base element, e.g. well inboard of that edge, say two-thirds. The lifter may thus be a handle pivoted to the base.

An embodiment of the invention is shown in the accompanying drawing, wherein:-

Fig. 1 is a plan view of the mounting;

Fig. 2 is an underplan view of the mounting;

Fig. 3 is an end elevation of the mounting in position on a metallic structure;

Fig 4 is a side elevation of the mounting in position on a metallic structure;

Fig 5 is a partial vertical section taken on the line V-V in Fig 1;

Fig 6 is a perspective sectional elevation, with parts shown in separated condition, of a universal joint assembly.

In the following description, given by way of illustrative example only, the magnetic mounting of the invention is described in relation to its attachment to the steel roof of a vehicle, the roof having curvatures in two angles at a right angle, as seen in Figs. 3 and 4.

Referring to Figs. 1 and 2, the mounting has a rigid baseplate or tray 1 which may support or be incorporated in any desired item to be carried by the mounting, e.g. a sign carried on the roof of the vehicle. The nature of the structure carried is immaterial. The tray 1 is supported, relative to the vehicle roof 2 (see Figs. 3 and 4) by a pair of assemblies 3,3, carried at spaced positions below the tray 1. Each assembly 3,3 comprises a flexible magnetic member 4 (see Fig.5) which is attached to the tray 1 by a universally-movable joint assembly 5.

The magnetic member 4 comprises a relatively stiff but nevertheless flexible metal backing sheet 4a beneath which is a flexible sheet 4b of a permanently magnetic synthetic compound material. The magnetic sheet material is bonded to the backing sheet. The magnetic sheet material could be, for example, the proprietary material marketed under the Trade Marks "PLACOR" and "PLACAM". The magnetic sheet material is (a) capable of flexing so as to lie snugly against the surface of the steel roof 2, and (b) very strongly adherent to the roof 2, by virtue of its magnetism.

The magnetic sheet 4b is cut away at four small areas to accommodate the (sunken) heads of four rivets 6 which attach to the member 4 a part-spherical inverted cup 7 having a flange 7a bored to receive the rivets 6. The cup 7 has a central clearance aperture 8 in which is received a bolt 9 having its head 9a engaging, through a washer, with the underside of a part-ball 10 seated within the cup 7 and serving as an inner holding element. The other end of the bolt 9 receives a nut 11 permitting the bolt 9 to clamp a cross-member 12 of the tray 1, the tray 1 itself, and a bearing outer member 13, serving as an outer holding element, having a part-spherical recess to receive the part-spherical upper face of the cup 7. It will be seen that the mating part-spherical surfaces of the part-ball 10, and of the cup 7, and of the outer member 13, will permit the cup 7 to move relatively in all directions, about the geometrical centre of those surfaces, to an extent which is limited by the central clearance aperture 8 of the cup 7. This pos-

sibility of universal movement permits the cup 7 to (a) assume any position of inclination dictated by the magnetic engagement of the member 4 on the vehicle roof, and (b) be tightened, in that position of movement, to the tray 1. Once the correct position has been achieved, the nut 11 can then be tightened to lock the joint assembly.

As can be seen from Figs. 3 and 4, the roof 2 has curvature in two directions at a right angle, and the cups 7 are correspondingly inclined relative to the plane of the tray 1.

As the magnetic member 4 can conform entirely to the surface and curvature of the roof 2, the magnetic force holding the two together is extremely high. By way of simple illustration, an experiment using a magnetic mounting having the material referred to above gave the following results: The mounting constructed as seen in these figures had two assemblies 3,3 each 15 inches by 19 3/4 inches. On the tray 1 there was secured an upstanding sign of triangular vertical section and 54 inches in length and 17 inches in width at its base, with a height of 12 inches. The entire structure was secured, by its magnetism only, on the steel roof of a vehicle. The vehicle was then subjected to tests in a wind tunnel, with the sign (a) end-on, and (b) broadside-on to the airflow. In the end-on position, the sign remained in position on the vehicle roof at up to a wind speed of 210 m.p.h., which was the maximum available. In the broadside-on position, the sign remained in position on the vehicle roof at up to a wind speed of 130 m.p.h., at which point the structure of the sign itself (not of the mounting) started to buckle.

To achieve the maximum secure magnetic adherence of the magnetic members 4 to the vehicle roof or other metal structure, it is desirable to ensure that the joint assemblies 5 shall be positioned well inboard of the edges of the sheet members 4, i.e. as seen in Figs. 1 and 2.

The adherence of the sheet members 4 to the metal roof is enhanced if the sheet members 4 lie snugly against the metal roof all over their area. Removal of the sheet members 4 from the metal roof can in practice only be achieved by a form of "peeling" action. It is necessary to lift a small edge portion of the sheet member 4, and then progressively peel off the remainder of the sheet member. To facilitate this operation, there may be provided a lifter denoted generally by the reference numeral 14 in Fig. 5. This comprises a handle-like bar 14a which is secured by a rivet 15, having its head recessed in the magnetic sheet 4b, to a part adjacent the edge of the sheet member 4. The bar 14a is cranked to provide a handle 14b for ease of

operation. To commence the "peeling" action, the bar 14 a is lifted by the handle 14b, and the rivet 15 drags up a small zone of the sheet member 4 and parts it from the vehicle roof 2.

Then after, the upward movement of the handle 14b causes progressive lifting of the member 4 which can eventually be wholly lifted away from the vehicle roof. In practice, in a convenient construction, the lifter 14 is rotated, after engagement of the mounting on the roof, from the laterally-extended position of Figs. 1, 2 and 5 through 90° so as to lie in the transverse direction, such that attachment of the remainder of the sign onto the tray 1 effectively covers the lifter 14 and makes it theftproof.

Claims

1. A magnetic mounting means comprising:

(i) a base element to overlie a zone of a magnetically-attractable sub-structure, said base element being flexible to enable it to adapt itself to the contour of the sub-structure and to lie intimately in contact with a surface of the sub-structure at least at island sites, said base being permanently magnetic over at least said island sites;

(ii) a support

(iii) two spaced couplings each connecting a respective area of the base element to the support, each said coupling permitting a universal movement within limits of its respective connected area of the base element relative to the support.

2. A magnetic mounting means comprising:

(a) a support

(b) a pair of base elements each adapted to overlie a respective zone of a magnetically-attractable sub-structure, each said base element being flexible to enable it to adapt itself to the contour of the respective zone of the sub-structure and to lie intimately in contact with the surface of the sub-structure at least at island sites, each said base being permanently magnetic over at least said island sites;

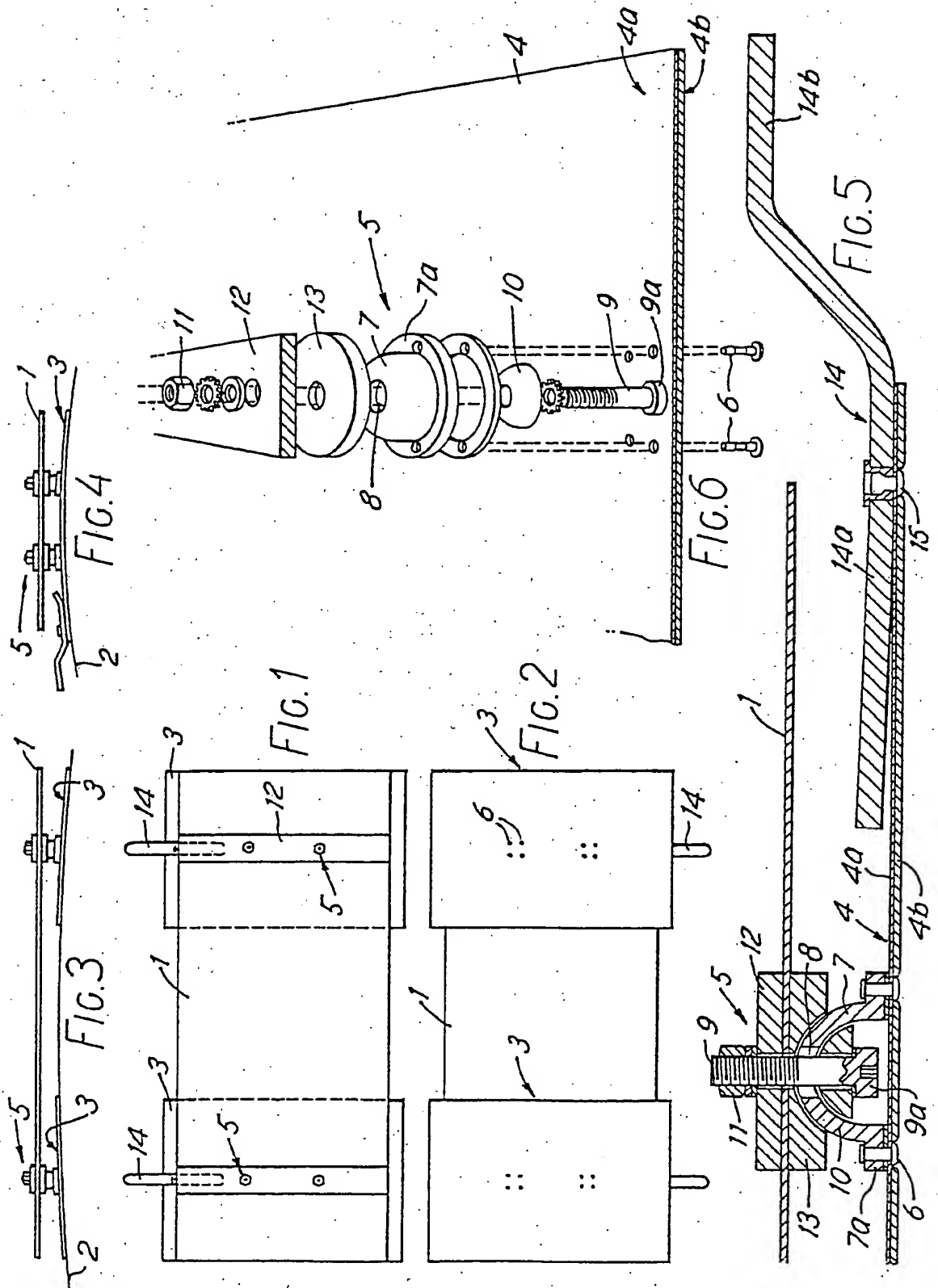
(c) a respective pair of spaced couplings for each base element, the couplings of each pair each connecting a respective area of the base element to the support, each said coupling permitting a universal movement within limits of its respective connected area of the base element relative to the support.

3. A magnetic mounting means, as claimed in either of claim 1 and 2, wherein the or each said base element is permanently magnetic over its whole area to contact the surface of the sub-structure, said base element comprising a flexible layer having permanent magnetic property.

4. A magnetic mounting means, as claimed in any one of claims 1 to 3, wherein each said coupling comprises a cup element secured to an area of the base element and having inner and outer part-spherical surfaces within a common centre, inner and outer holding elements respectively embracing said inner and outer part-spherical surfaces of the said cup, means retaining said holding elements and said cup in assembly and permitting rotational movement within limits of said holding elements with respect to said cup about the centre thereof, and means securing said outer holding element to said support.

5. A magnetic mounting means, as claimed in claim 4, wherein said retaining means are tightenable for retaining said holding elements in a position of rotation to which they are set.

6. A magnetic mounting means, as claimed in any one of claims 1 to 5, incorporating a lifter secured to a point of said base element adjacent to an edge thereof and extending inboard of said point of securing for abutment against the base element.





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EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 87300446.9
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR - A - 1 586 369 (DEPARIS) * Fig. 1,2 * --	1,2	B 60 R 13/10
Y	GB - A - 968 487 (FORTENBACHER) * Fig. 3 * --	1,2	
Y	US - A - 3 665 355 (SASAKI et al.) * Abstract * --	1,2	
A	US - A - 3 440 748 (HACKLEY) * Fig. 1 * ----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 60 R H 02 N H 01 F
Place of search VIENNA		Date of completion of the search 24-06-1987	Examiner PANGRATZ
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	